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The Solar Ocean Energy Liaison

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November 1980

DOE RESPONDS TO INDUSTRY BY AMENDING TERMS OF BIDS FOR 40-MEGAWATT OTEC PILOT PLANT

The widespread negative reaction of private industry to the terms of the PON (Program Opportunity Notice) for a 40-megawatt OTEC pilot plant put forth by the US Department of Energy has resulted in an amendment/modification released in early December. Early reactions from industry spokesmen to these modifications, detailed below, indicate that substantial industry-wide bidding for this major project is anticipated.

The initial activities surrounding the US OTEC program's major phase of development—design and construction of OTEC pilot plants—began on a decidedly sour note: the unfortunate pre-proposal conference for potential bidders (see the October 1980 issue of OE). Private industry reacted by informing DOE and other federal agencies concerned with the project of the rationale behind their reluctance to bid the PON in its initial form.

Much of industry's communication with federal agencies in this regard has been done privately. However OE has received permission to attribute various reactions and communications between industry and government.

Typical of industry's reaction to the terms of the pilot-plant PON is that of The Trane Company of La Crosse, Wisconsin in its exchange with Richard A. Frank, Administrator of the National Oceanic and Atmospheric Administration (NOAA), the agency designated by public law to coordinate DOE's efforts toward commercialization of OTEC. NOAA is an agency of the US Department of Commerce.

Mr. Frank wrote on October 7th to a representative cross-section of industrial firms pursuing OTEC technology to determine their degree of corporate commitment. This matter has been an ongoing bone of contention evidenced repeatedly by, for example, testimony of the private sector before Congressional hearings during the last 18 months.

Richard J. Campbell, the President and Chief Operating Officer of Trane, replied to Frank in early November, accompanied by an internal memo to Campbell from Harry D. Foust, the Manager of Trane's Applied Technology Division.

In reviewing the risks associated with an active Trane participation in DOE's OTEC pilot-plant PON, Campbell said: "Both the financial risk associated with becoming an active member of a consortium and the lengthy timetable for this PON to reach fruition lessen its merit as a sound economic investment."

Among the risks cited in Foust's memo were the currently undefined investment tax credits, "a highly undesirable aspect of investment/return prospect", and the fact that bidders for the early phases of the PON would be likely to be eliminated in later phases, with doubts about tax credits in such a case.

In addition, Foust pointed out the risk of uncertain confidence in other members of a proposed bidding team to meet with complete success in developing their technology ("That is, a heat exchanger cannot provide an economic return if the cold-water pipe cannot be made successful.") and that this concern could be extended to other consortium members.

Campbell's position at the time of his letter to Frank was to decline investment opportunities in this OTEC program. However he pointed out that Trane would continue their ongoing "limited research activities", particularly to improve the seaworthiness of their aluminum heat exchangers.

Trane's position was echoed by other firms. Both J. Ray McDermott and Westinghouse, among others, have decided not to be prime on the PON, although they may participate on a subcontractor basis.

Suggested possible amendments to the PON were made to DOE by a loosely organized group representing the industrial sector, and some of these suggestions were included in the subsequent DOE amendment.

Amendments to the PON

Where the closing date for receipt by DOE of PON bids was originally January 9th, 1981, this was extended to January 30th by the November 3rd amendment, and on December 11th DOE further extended the final date to February 27th.

Initially, five to eight $500,000 awards were specified for Phase I of the PON. This has now been increased to $900,000 per award.

These two major modifications have resulted in indications of increased participation in bidding on the pilot-plant project. At one point, there was talk of no

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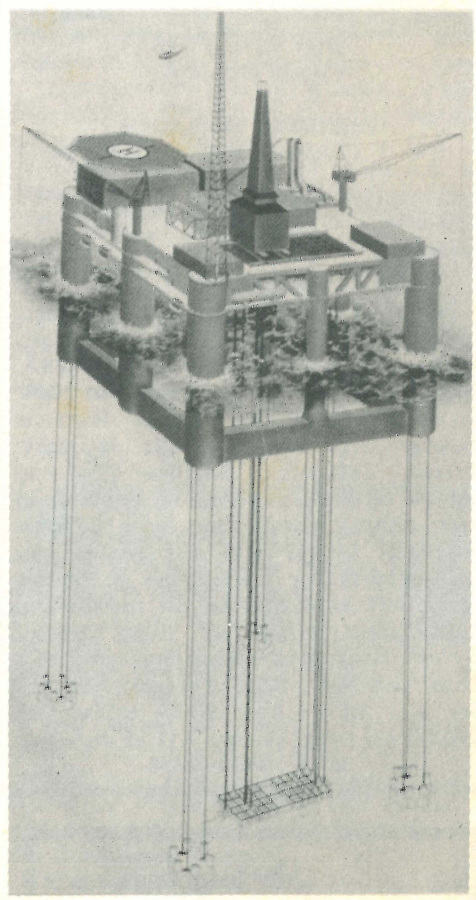

DEEPER AND DEEPER: Evidence of the offshore construction industry's continued efforts to go to greater depths for petroleum will influence the design and siting of OTEC plants. Illustrated above is the WORLD'S FIRST TENSION-LEG PLATFORM planned for Conoco that will open up to 6,000-foot depths for operations in the North Sea. The platform uses a floating structure tethered to the sea bottom with steel tubes. The tubes are held under tension by the upward buoyant force on the platform, with the tension on the tethers providing stability for the platform itself. The design recently received the approval of the British Government.

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SOLAR OCEAN ENERGY

DOE RESPONDS TO INDUSTRY BY AMENDING TERMS OF BIDS FOR 40-MW OTEC PILOT PLANT

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bidders whatsoever; however it is now estimated that there will be at least eight teams making bids.

A good deal of confusion arose regarding contractor/consortium composition—including changes. The DOE amendment clarified further that (a) while DOE would not replace one consortium with another once Phase I awards are made, the consortium would be allowed to change its composition subject to DOE approval; and (b) the designation of prime contractors could be changed during contract performance, as long as the replacement prime contractor was a member of the original team, again subject to approval by DOE.

The amendment included both a list of the attendees of the pre-proposal conference and 153 questions and answers submitted to DOE by potential bidders. The latter information was expected to be available at the much-criticized early-October pre-proposal conference, and its absence angered many attendees.

Although the OTEC pilot-plant project had gotten off to a bad start, the "mating dance" of consortium formation is solidifying with proposed pilot-plant sites virtually worldwide and team formation involving a varied array of members, including foreign firms.

The composition of these consortiums, selected sites, and proposed plant concepts will be detailed in OE as current rumors graduate to the firmness of fact.

NOAA FUNDS OTEC STUDIES ON COLD-WATER-PIPE MATERIALS

The National Oceanic and Atmospheric Administration has awarded a contract to Science Applications Incorporated (SAI) of El Segundo, California to evaluate composite materials to be used in the construction of cold-water pipes for planned OTEC facilities.

With SAI as prime contractor, the testing program will be carried out by Structural Composites Industries Incorporated (SCI) of Azusa, California as subcontractor. The subcontract has been funded at $160,000.

The objective of the program is to fabricate and conduct material property tests of various fiberglass reinforced plastic samples for potential use in OTEC cold water pipes. Multiple designs will be considered initially, with successful designs subjected to further extensive testing by SCI. Material properties, including tensile, compressive, fatigue, shear, and creep strength; elastic, shear, and bulk modulus; and Poisson's ratio, will be investigated. Samples will be tested in both air and water over a 12-month period.

MARINE TECHNOLOGY '80 HELD IN WASHINGTON

Sea Solar Project Unveils New OTEC Plant Design

The 16th Annual Marine Technology Society (MTS) Conference, called Marine Technology '80, was held in Washington DC October 6th through 8th, 1980 with an expanded program and over 1600 in attendance. Of the 102 companies exhibiting at the meeting, most were enthusiastic over the response

With the conference theme "Decade of the Oceans", ocean energy was focused on in two sessions, one on *Ocean Energy Systems,* co-chaired by Dr. Paul Walsh of VSE Incorporated and Dr. Abraham Lavi of ERDI Incorporated, and the other titled *New Design Concepts and New Regulations* and co-chaired by Dr. Terence McGuinness of NOAA and Alexander Matlin of Dravo Van Houten Incorporated. The two technical sessions brought a combined total of 11 presentations to the conferees specifically dealing with OTEC technology and related subjects.

Two of the latter were *Regulatory Concerns for Inspection, Maintenance, and Repair of Fixed and Floating Ocean Thermal Energy Conversion Plants,* presented by Donald G. Hervey and Larry D. Larsen, both of Brown and Root Incorporated, and *Regulatory Requirements and Guidelines for the Construction, Operation, and Maintenance of Fixed OTEC Ocean Energy Offshore Facilities,* presented by Robert J. Scott and Eric Midboe of Gibbs and Cox Incorporated and William Hannon of the American Bureau of Shipping.

J. Hilbert "Andy" Anderson of Sea Solar Power, in his paper entitled *Design Features of a Sea Solar Power Plant,* unveiled the latest concept of a 100 MW demonstration OTEC plant. encompassing improve- that resulted in the design of a pre-commercial scale plant which would weigh only 33,000 tons—far smaller than any other designs for that size facility. [As a basis for comparison, Anderson's paper cited early Lockheed designs for a 160 MW plant estimated at 344,000 tons.]

The design presented by Anderson at the MTS meeting is for a semi-submersible OTEC plant with boilers in a plenum chamber at the bottom permitting construction on a flat concrete mat. The four warm-water pipes act as structural supports for the condenser plenum chamber at the middle and the machinery decks and warm-water inlet at the sea's surface. By submerging the heat exchangers in the water a low pressure difference across the surfaces was achieved, permitting lighter construction and thus lower costs. The model of the design was developed from ideas furnished by the Sun Shipbuilding Company, which suggested a feasible construction method.

Specifically, Anderson sought to increase cost efficiency by designing heat exchangers with minimal surface area, low

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friction losses, and low power requirements for water pumping. Also, minimized water flow, with consequent savings in the cost of materials, resulted in substantial weight reduction.

Dr. Robert Cohen Honored

Among the awards presented to worthy individuals and companies at the MTS conference was the *Compass Distinguished Achievement Award,* presented to Dr. Robert Cohen of the Ocean Systems Branch of the US Department of Energy for initiating Government efforts in pursuing OTEC. Other individuals receiving various awards at the meeting who have taken an active part in OTEC/ocean-energy activities were Phillip Eisenberg, president of Hydronautics Incorporated; Charles D. Matthews, president of the National Ocean Industries Association; and Dr. John Craven of the University of Hawaii and the Natural Energy Laboratories of Hawaii.

Next year's MTS Annual Conference—Oceans '81—will be held in Boston, Massachusetts September 16th through 18th.

DATE AND SITE SET FOR 8TH OCEAN ENERGY CONFERENCE

As described briefly in our October issue, the Marine Technology Society (MTS) will manage the 8th Annual Ocean Energy Conference (OE8) for the US Department of Energy as principal sponsor. The Conference will be held at the Capital Hilton Hotel in Washington DC June 7th through June 11th.

The Conference Chairman is Harry E. Irwin, who also serves as Executive Director of MTS. Further information can be obtained from MTS, 1730 M Street Northwest, Washington DC, (202) 659-3251.

NEW STUDY SHOWS 61% OF AMERICANS WANT EXPANSION OF SOLAR ENERGY

A study released in October 1980 by the President's Council on Environmental Quality (CEQ) shows that 61% of Americans polled chose solar energy as the energy option the country should concentrate most on developing. The CEQ survey is available from that organization at 722 Jackson Place Northwest, Washington DC 20006, (202) 395-5770.

NOTICE

Following the mailing of our October issue, OE was advised by several subscribers that a printing error had resulted in some blank pages. We will be happy to mail corrected issues free of charge on request. OE regrets this inconvenience.

MINI-OTEC OCEAN-BASED ELECTRICAL POWER GENERATOR WINS ENGINEERS' AWARD FOR OUTSTANDING ACHIEVEMENT

Honolulu: An award as one of the ten most outstanding engineering achievements of 1979 was given to the Mini-OTEC project November 2nd by the National Society of Professional Engineers, meeting here. James G. Wenzel, Lockheed Missiles and Space Company vice-president, accepted the award on behalf of the industry/state team that designed, assembled, and operated the ocean-water-powered electrical demonstrator.

The miniature ocean thermal-energy conversion (Mini-OTEC) platform demonstrated for the first time during three and a half months of operation that it is feasible to use the sun's energy stored in the ocean surface to generate electricity.

Stationed off the Kona Coast of the Island of Hawaii, the Mini-OTEC generated 50 kilowatts, as predicted by the design engineers, and delivered 10 kilowatts of net energy to power the test instruments on board and a refrigerator and lights for the crew.

"There are still many economic and technical factors to be addressed before OTEC becomes a commercial reality acceptable to the electrical-power industry," Wenzel told the audience at the Honolulu dinner meeting. We are in the process of forming a similar industry/state team to pursue further resolution of these issues.

"Objectives would include better knowledge of cold-water pipe construction and behavior, more-exact definition of heat-transfer characteristics, wider knowledge of environmental impact, and the potential of hardwire to shore.

"We are firmly convinced that the partnership of state and industry that has already been demonstrated is an effective way to establish the technology credibility of OTEC in supplying electrical power for tropical island communities."

Wenzel hailed the Hawaii and industry teamwork. "Mini-OTEC was the result of a true partnership between the State of Hawaii and private industry in seeking to validate an alternative energy technology having the potential to contribute substantially to our national goal of energy self-sufficiency."

Wenzel traced the history of OTEC—which began nearly 100 years ago as an idea of the French physicist Jacques d'Arsonval.

"When the first engineering studies of OTEC were initiated in 1974, there were many authoritative voices to proclaim that it would be too impractical and costly," Wenzel said.

Demonstration Proves Critics Wrong

"To rebut these claims, we were determined to design and sponsor a proof-of-concept demonstration that the critics were wrong. Mini-OTEC was deployed only 15 months after the project was formally approved.

"We learned a lot during its few months of operation. Contrary to the predictions of the critics, the heat exchangers were not clogged by fouling from marine organisms. The cold water did not contain large amounts of dissolved gases to reduce the rate of heat transfer. Internal losses did not consume all the generated power.

"We know that OTEC is technically feasible; we are convinced that it can be made economically competitive (particularly in places like Hawaii); and we urge strongly that the country pursue the option as vigorously as possible."

ROCKWELL AND TRACOR TO OPERATE OTEC-1 FOR TWO YEARS

A mid-November announcement to OE advises that a contract for the operation of OTEC-1 has been awarded to the Energy Technology Engineering Center (ETEC) of the Energy Systems Group of Rockwell International of Canoga Park, California.

Tracor Marine Incorporated of Port Everglades, Florida will manage the operation as subcontractor to the ETEC, with Robert S. Munier as the Tracor manager.

The two-year contract is valued at approximately $8 million, with options for an additional two years.

Global Marine's contract expired as of November 15th, but they will continue operation of OTEC-1 under a two-week extension until the Rockwell/Tracor team takes over.

As of November 17th, OTEC-1 was on site, the cold-water pipe was in place, and the water was pumping.

CALL FOR PAPERS FOR 1981 OCEAN ENERGY CONFERENCE

The Eighth Annual Ocean Energy Conference, with the theme "Ocean Energy: Meeting the National Goals", will be held at the Capital Hilton Hotel in Washington DC June 7th through 11th, 1981 and organized by the Marine Technology Society (MTS), with headquarters in that city.

The Conference format is being developed to include plans on how to meet the national goals stated in Public Law 96-320, signed by President Carter this summer, with papers to be presented responsive to the Conference theme.

Abstracts must be submitted no later than January 20th, 1981 to the Technical Committee Chairman, Eighth Ocean Energy Conference, Marine Technology Society, 1730 M Street Northwest, Suite 412, Washington DC 20036, (202) 659-3251.

US GOVERNMENT PROCUREMENT INVITATIONS AND CONTRACT AWARDS

Listed below are procurement invitations and contract awards related to OTEC in particular and ocean resources in general culled from the *Commerce Business Daily.* This is not to be construed, however, as a complete list.

Oct 14: Ad-Hoc Studies and Evaluation of Electric Power Generating Plants: Contract DE-AC-02-78-ET-34222.A009, for $104,500, awarded to United Engineers and Constructors, 30 South 17th Street, Philadelphia, Pennsylvania. US Department of Energy, 9800 South Cass Avenue, Argonne, Illinois 60439.

● **Oct 14: Dynamic Interaction Between an OTEC Power Plant and a Power Grid:** Contract DE-AC-02-80-RA-50274.A000, for $135,000, awarded to Energy Research and Development International, 5530 Dunmoyle Street, Pittsburgh, Pennsylvania. US Department of Energy, 9800 South Cass Avenue, Argonne, Illinois 60439.

Oct 14: Radioelement Studies in the Ocean: Contract DE-AC-02-76-EV-03563 .A006, for $475,000, awarded to Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543.

● **Oct 15: Mitigation of Biofouling Using Surface Coatings:** Contract DE-AC-02-80-ER-10766.A000, $210,000, awarded to the Calspan Corporation, Buffalo, New York 14225. US Department of Energy, 9800 South Cass Avenue, Argonne, Illinois 60439.

Oct 15: Establishment of the Consumer Protection Solar Co-ordination Committee and Solar Technology Assessment Project: Contract DE-FC-02-79-CS-30278.A001, for $191,124, awarded to the University of Central Florida, PO Box 25000, Orlando, Florida 32816.

Oct 15: Study of the Factors to Stimulate Commercial Production of New Energy Forms: Contract AC-01-80-PR-10086 (unsolicited proposal), for $30,000, awarded to the University of Pennsylvania, Philadelphia, Pennsylvania 19104. Department of Energy, Office of Procurement Operations, Washington DC 20585.

Oct 15: Study of the Barriers and Incentives to the Commercialization of Full Cell Technology: Contract AC-01-80-ET-17076 (unsolicited proposal), for $73,000, awarded to the University of Pennsylvania, Philadelphia, Pennsylvania 19104. Department of Energy, Office of Procurement Operations, Washington DC 20585.

Oct 15: SPE Water Electrolysis Hydrogen Generation Development Program: Contract DE-AC-02-78-ET-26202.A008 (cost plus fixed fee), $1,456,000, awarded to General Electric Company, Direct Energy Conversion Programs, 50 Fordham Road, Wilmington, Massachusetts 01887. US Department of Energy, Brookhaven Area Office, Upton, New York 11973.

Oct 16: Report on the Role of the Energy Technology of the United States in the Soviet Union: Contract 033-4680.0, September 15th, 1990, $30,644, awarded to EG&G Washington Analytical Service Center Incorporated, Washington DC. Office of Technology Assessment, US Congress, Washington DC 20510.

Oct 17: Program Support for Solar Program Areas: Contract AC-01-80-ET-20647 for $3,582,327, awarded to The Meridan Corporation, Alexandria, Virginia 22312. Department of Energy, Office of Procurement Operations, Washington DC 20585.

Oct 17: Energy Forms Development Design Support Services: Contract AC-01-80-EI-10307, for $100,088, awarded to GP Technology Corporation, Landover Hills Maryland. Department of Energy, Office of Procurement Operations, Washington DC 20585.

Oct 17: Studies With Non-Renewable Energy Resources: Contract AC-01-80-PE-70271, for $2,468,707, awarded to The Rand Corporation, 1700 Main Street, Santa Monica, California 90405. Department of Energy, Office of Procurement Operations, Washington DC 20585.

● **Oct 17: Provide Assistance to Develop and Implement a Commercialization Process Which Will Accelerate the Market Adoption of Energy-Efficient and Solar Technologies in Support of the Office of Commercialization Conservation and Solar Application:** Contract AC-01-80-CS-10070, $263,465, awarded to Market Facts Incorporated, Chicago, Illinois 60606. Department of Energy, Office of Procurement Operations, Washington DC 20585.

Oct 17: Studies of Energy and National Security: Contract AC-01-80-PE-70267, for $2,663,455, awarded to The Brookings Institution, Washington DC 20036. Department of Energy, Office of Procurement Operations, Washington DC 20585.

Oct 17: Engineering Services for Fixed Ocean Facilities, Operation, Maintenance, Inspection, and Repair: Contractor to perform tasks related to operation, maintenance, inspection, and repair of ocean-based facilities. Tasks shall be provided for development related to ocean engineering function of siting, design, construction, installation, operation, maintenance, inspection, and repair of fixed ocean facilities. Contractor will be responsible for development of structures, equipment, and techniques to perform these functions. Engineering services will be provided under an open-end contract with a total cumulative amount not to exceed $90,000. No task shall exceed $20,000. Contract period of performance will be 360 calendar days. This will be a fixed-price contract. Selection criteria are: (1) firm's experience and capabilities in ocean engineering; (2) professional qualifications of key personnel for the various tasks; (3) experience and knowledge of offshore and maritime hardware, structures, and platforms, particularly logistics facilities; (4) ability to provide rapid response to the task requirements. Firms which meet the requirements described are invited to submit current forms SF-254, unless already on file with this office, and SF-255, US Government Architect-Engineer Qualifications, within 14 days after the date of this announcement. Firms desiring consideration shall submit appropriate data as described in Note 62. This is not a request for proposal. Direct all inquiries to Virginia Collins, 805/982/5506/3473, Reference 81-0002.

Oct 20: Development and Testing of Non-Destructive Techniques to Measure the Thickness of Corrosion-Pitted Steel Structures Underwater: Contractor to develop and conduct preliminary laboratory testing of techniques and equipment for use by Navy divers to measure the thickness of corrosion-pitted steel structures underwater. The contractor shall furnish all labor, materials, and equipment necessary to identify, evaluate, and conduct testing on the above effort. Reports shall be submitted in accordance with a report schedule of milestones. This will be a fixed price contract with an approximate level of effort of 790 direct labor hours. Contract period of performance will be 210 calendar days after award of contract. Selection criteria: (1) knowledge of and experience with non-destructive testing techniques and equipment; (2) experience and ability to conduct laboratory testing and evaluation of prototype equipment; (3) familiarity with the marine environment and knowledge of its effect on materials, equipment and limitations imposed on the working diver; (4) technical competence and experience of personnel assigned to the project. Firms which meet the requirements described are invited to submit current Forms SF 254, unless already on file with this office, and SF 255, US Government Architect-Engineer Qualifications, by the close of business 14 days after the date of this announcement. Firms desiring consideration shall submit appropriate data as described in Note 62. This is not a request for proposal. Direct all inquiries to Virginia Collins, 805/982-5506/3473. Reference 81-0011. Civil Engineering Laboratory, Attn: Code L23, Naval Construction Battalion Center, Port Hueneme, California 93043.

Oct 20: Fabrication of Thermoelectric Power Source: Contract DAAK20-80-C-0315, September 30th, 1980, for $129,500, awarded to the Canadian Commercial Corporation, Ottawa, Ontario, Canada.

Oct 21: Develop a System Concept and Demonstration Program for Use by State and Federal Agencies to Schedule and Monitor Key Regulatory Actions for Major Energy Facilities: Contract DE-AC-44-80-R-420014, $54,107, awarded to Southern States Energy Board, 2300 Peachford Road, One Exchange Place, Suite 1230, Atlanta, Georgia 30338. Department of Energy, Region IV, 1655 Peachtree Street Northeast, Atlanta, Georgia 30367.